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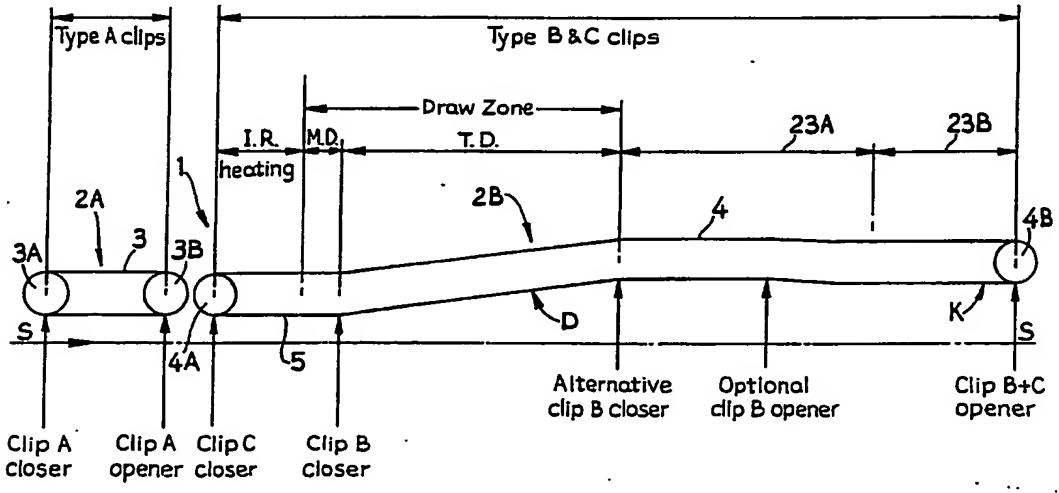

(57) Abstract

A stenter system (1) comprises a preliminary stenter (2A) providing extrusion speed hold-back of film and, downline therefrom, a main stenter (2B) which includes an initial substantially parallel section (5) in which machine-direction stretching of the film takes place followed by a diverging section (D) where transverse stretching of the film occurs. A preferred film clip for use in this stenter system comprises a film holding/gripping element in the form of a plate (8) or a roller (19) and a clip body (6) for supporting the holding element (8, 19) which clip body can form part of a clip chain. The holding element (8, 19) is carried by the body (6) such that it can swing in a plane parallel to the machine direction into and from a film holding/gripping position, and the element is swung by means of an eccentric drive (9, 11, 13) actuated for example by cam surfaces (17, 18). On film gripping, the holding element (8, 19) can have a self-generating gripping action imparted thereon by the longitudinal film drawing force (P).

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"STENTER APPARATUS"

Description

The present invention relates to stenter apparatus for orientating film, and more specifically to improved film clips for use in stenter apparatus.

Stenter apparatus for orientating (or stretching) film normally comprises spaced pairs of endless chain arrangements which define therebetween a feed path for film, the chain arrangements carrying stenter clips to hold the film for transport thereof in the feed path. Such stenter apparatus is shown in published European Patent Application 0122787, the chain arrangements of this European Patent Application defining a bi-axial orientation section and a separate higher speed clip chain system which provides traction. The stenter clips of this prior art stenter swung in a transverse direction, ie in conventional manner, relative to the machine direction between a film holding position and a freed or open position, and were arranged as two special types serving to hold downward directed edge bead of beaded film in slots in film support plates of the apparatus whereby orientation of the film was facilitated, the first clip type defining a gripper clip to provide hold back or pull on the film (ie for machine direction film orientation) while the second clip type permitted film slippage in the clip during transverse stretching of the film, so that this prior art stenter could provide simultaneous bi-axial orientation of this film by means of controlled operation of the two clip types. It is the specific object of the present invention to provide an improved stenter apparatus in the light of the above prior art stenter.

According to the basic characteristic of the present invention a preliminary hold-back device eg stenter provides extrusion speed hold-back to the film and a main stenter comprising an initial substantially

parallel section in which machine direction stretching takes place followed by a diverging section where transverse stretching takes place.

Preferably the apparatus is adapted for handling edge beaded film with the edge-bead directed upwardly.

Preferably the apparatus includes clip means for holding the beaded film which clip means is arranged to function such that during film movement in said initial section of the main stenter film slippage is possible relative to the clip means.

Additionally the apparatus will include sets of clips with a first set in the preliminary stenter means to grip and hold back film and a second set in the main stenter means operable to grip film to facilitate a pulling action on the film.

By appropriate operation of the clip means, the above stenter apparatus of the present invention can provide two-stage bi-axial orientation (stretching) of film and, where applicable, bi-axial film orientation of a simultaneous nature is possible.

According to a second aspect of the present invention a film clip for use in stenter apparatus comprises a film holding element, mounting means for said film holding element such that said element is movable in a plane essentially parallel to the machine direction of the stenter apparatus, and drive means for swinging movement of said element in said plane into and from a film holding position. The film clip is especially but not exclusively intended for use with an edge beaded film having the edge-bead directed upwardly.

Preferably the drive means is of eccentric type, and preferably the clip is arranged such that when the film holding element is swung by the drive means towards a bottom dead centre position for film gripping, in the film holding position the holding element trails or lags said bottom dead centre position. Consequently, with the film tensioning direction opposite to the lagging direction, the film tensioning action will provide a

self-generating gripping effect at the clip.

The film holding element may take the form of a plate, which is especially suitable for providing a film holding back or draw action at the clip, or alternatively may be in the form of a roller facilitating film slippage relative to the clip.

Preferably the drive means includes a cranked spindle, with an actuator coupled to a first spindle portion for pivoting motion of the cranked spindle, said holding element being swingably mounted on a second spindle portion eccentrically located relative to the first spindle portion. The actuator can be moved by suitable control means such as for example cams.

Bead edge severing means can be provided for removal of the edge-bead at the completion of the stenter process and in a preferred embodiment the clip includes a bead clearing element which functions when the clip is moving around an end sprocket to clear the severed bead.

An embodiment of the present invention will now be described by way of example with reference to the accompanying drawings wherein:

Fig 1 shows schematically a film orientation system according to the present invention, only one side of the rail arrangement of the system being shown, the other side being a mirror image of the side shown;

Fig 2 shows schematically the location of the clip actuating cam surfaces in the system;

Figs 3 and 4 show side and end elevations of a stenter clip for providing machine direction draw of film in the system;

Fig 5 shows a side view of the body part of the clip;

Fig 6 shows a clip similar to that of Figs 3, 4 for a further embodiment;

Figs 7 and 8 show similar views to Figs 3 and 4 for a further form of clip;

Fig 9 shows an end view of a further modified clip,

while Fig 10 shows a basic illustration of the operating mechanism in Fig 9 looking in the direction of arrow X,

Fig 11 shows a modification to the orientation system of Fig 1, in schematic side view, and

Fig 12 shows a plan view of a clip with a modification for edge bead removal.

Referring to Figs 1 and 2, a bi-axial orientation system 1 for film includes a preliminary stenter 2A and a main stenter 2B, each of the stenters 2A, 2B comprising a pair of spaced endless chains 3, 4 located on either side of the symmetry line S-S of the film feed path, the endless chains 3, 4 on only one side being shown, the chains on the other side being a mirror image of the chains 3, 4. The endless chains of the system pass around end sprockets (3A/B, 4A/B), and selected sprockets serve as drive sprockets for the chains.

It is a feature of the arrangement that the film processed in the apparatus 1 is provided with edge-beads and the beaded film is passed to the apparatus 1 with the edge-beads directed upwardly. Suitable guides (not shown) will be present to feed the beaded film into the preliminary stenter 2A whence it is passed to the main stenter 2B, the edges of the film being held in the stenters 2A, 2B by means of three types of stenter clips A, B and C which are carried by the chains and which will be described in detail later.

Various treatment apparatus (chamber) are provided for the film passing through the stenter apparatus 1, the main stenter 2B includes zones for orientation of the film in the machine direction (MD) and transversely (TD) and subsequently a crystallization heating zone 23A and a cooling zone (23B) for the film, the stenter 2B terminating with a suitable exit arrangement for the film eg in the form of a take-off roller. In particular the main stenter 2B includes a diverging section D for

transverse orientation of the film.

It is a particular feature of the apparatus 1 that immediately prior to the diverging section D there is located a substantially parallel section 5 at the inlet of the main stenter 2B. The initial parallel section 5 includes film heating means (specifically in the form of an infra-red heater) while the diverging section D includes convection heating means for film. The chains 4 in the main stenter 2B are driven at a speed which is a multiple of the speed (V) of the chains 3 in the preliminary stenter 2A for the attainment of machine direction film orientation. Operation of the clips B, C in the main stenter 2B is conveniently achieved by cam surfaces 17, 18 located as shown in Fig 2.

Stenter clips of the type B shown in Figs 3 and 4 are present in the main stenter 2B and these clips B are designed to create film draw in the machine direction in the main stenter 2B. The clip B comprises a platform or base 6 which is mounted on a chain link base 7, a plate-form gripper blade 8 which co-operates with the base 6 to hold film F, and an eccentric drive 9 for the blade 8. It is a novel feature of the clip that the blade 8 is moved by the drive 9 into and from a film holding position in a plane which extends essentially in the machine direction ie in the plane of the paper for Fig 3, and this contrasts with the conventional stenter clip where the gripper blade pivots in a direction transverse to the machine direction. A lip portion 8A of the blade 8 serves to restrain inward movement of the upwardly-directed film bead 10 when the blade 8 is in the film holding position. The eccentric drive 9 comprises a cranked spindle 11 journaled in the base 6, the blade 8 being swingably mounted in one spindle portion 11A of the spindle 11 while an actuator lever 12 is pinned to a second spindle portion 11B, the two spindle portions 11A, 11B being eccentrically located via crank 11C. The actuator lever 12 carries a lateral pin 13 serving as a cam follower. The cam follower pin 13 engages

appropriately located cam surfaces 17, 18 for swinging of the spindle 11 to move the blade 8 to the closed (film gripping) and open positions respectively. A compression spring device 22 is located between the body 6 and the lever 12 and operates as an over-centre spring device to hold the lever 12 in the "open" and "closed" positions (as will be seen from Fig 3). Body 6 includes an ear 6C to receive one end of the device 22 while the other end of the device 22 is carried by the lever 12 at a point 12A co-axial with pin 13.

Thus the blade 8 is caused to swing (in the direction of arrow S) in the longitudinal (or machine direction) plane such that the blade 8 rises and falls vertically with respect to the longitudinally extending vertical plane. When the blade 8 is resting on the film F (Fig 4) with the bead 10 behind the blade centre line, the centre line M-M of the spindle crank (containing spindle portion 11A) lags by a set angle behind the vertical line M-N containing the bottom dead centre (bdc) of the swinging action, and with this arrangement the longitudinal pull P on the film F during film drawing tends to urge the blade towards the B.d.c.. position and thereby reinforces the gripping action ie film grippage is self generating. The lagging angle O may be for example 4^{o}.

The base 6 includes a top flange presenting a top stop or abutment surface 6B to limit upward swinging of the blade 8 and also to stabilise the blade 8 in the raised (open) position ie maintain the blade steady and level. The blade 8 includes a flat top 8B engaging with the surface 6B. Clips of the type A are used in the stenter 2A to hold back the film. Clip A is similar to clip B of Figs 3 and 4 but in this case the clip is assembled so that the centre line M-M' (shown dashed in Fig 3) of the spindle crank lags the vertical line M-N on the opposite side to that of clip B and such that the drawing forces P' transferred from the main stenter chain 4 develop a self-generating film grip on the clips

A, ie in the same manner as in clip B but in the opposite direction, the blade 8 of clip A swinging oppositely to the closed position via-a-vis clip B (in which situation line M-M lags line M-N in both cases). The lift L achieved by the pivoting lever 12 is indicated.

Clip C shown in Figs 7 and 8 is also used in the main stenter 2B, and this clip C has the same raising and lowering mechanism as that for clips A and B but in this case a roller 19 having a single peripheral lip 19A is used in place of the blade 8 and mounted so that the lip 19A prevents inward movement of the bead 10 whereby the width of the film F can be maintained during an increase of film speed through the parallel section 5 of the stenter 2B. The clips C alternate with the clips B on the chain 4 of the main stenter 2B and it is arranged that the clip C does not exert excessive downward pressure on the film F so that film slippage is possible relative to the clip C. A bottom stop 20 on the base 6 is engagable with a tail 12B of the lever 12 to limit pivoting movement of the lever 12 of the clip C. Again an over-centre compression spring device 22 is located between the clip base 6 and the lever 12 whereby, the lever 12 is swung over with a snap-action at the end of one cam surface 17, 18 to be in readiness for engagement with the other cam surface 17, 18. The section D-D in Fig 1 indicates the portion of stenter 2B where film draw occurs.

It would be possible to adapt the clip B of Fig 3 and 4 to carry out the function of the clip of Figs 7 and 8. Thus the clip B of Figs 3 and 4 could be provided with a stop arrangement to limit the downward swinging of the blade 8, such as for example the provision of the tail 12B and stop 20 shown in Fig 6, whereby in the operating mode a predetermined small clearance exists between the blade 8 and the film support surface 6A. Consequently longitudinal (machine direction) slippage is possible between the film and the

blade 8 of the clip C1 but the lip portion 8A can still engage the upwardly directed film bead 10 to preclude inward movement of the film edge.

The clip (A or B) in Fig 4 is shown mounted on a chain base 7 carrying links 20 for linking adjacent bases 7. The base 7 includes a plurality of rollers such as rollers 14, 15 running on a rail structure 16 carried by stenter frame 16A which also carries the operating cams 17/18.

In the operation of the stenter apparatus 1, clips A are closed over the feed run of chain 3 (opening at the end of the run) to hold back the film F while the clips B are closed at the end of the section 5 by the cam surface 17 (B2) (Fig 2) in the main stenter 2B to create the machine direction film orientation. After transfer from the preliminary stenter 2A to the main stenter 2B at base input speed V the beaded edge 10 of the film F is retained by the clips C in the parallel section 5 in which machine direction orientation takes place with the film speed increasing to speed V x draw ratio at the end of section 5 where the closing cams 17 (B2) of clips B are located. Clip C are closed by cam surface 17(C) at the beginning of section 5. Thereafter the diverging section D causes transverse direction film stretching to take place. Clips B and C will be opened at the end of the feed run of chain 4 by the cam surfaces 18 (B/C). Thus the gripper blades 8 of the clips A, B resist two (opposed) directions of machine direction tension while the idling lipped rollers 19 of clips C resist transverse direction film tension.

A general advantage of the stenter process is that film entry to the preliminary stenter 2A and transfer to the main stenter 2B can be at slow speed and this allows the use of effective guides with for example the film sliding between polished guide surfaces, the upper surface being suitably shaped to come into engagement

with the bead 10 to guide the film edges onto the clip platforms (6A). The distance between the ends of the preliminary stenter 2A and the beginning of the main stenter 2B need not be variable so that the simplicity of the film transfer means can be maintained. It will be evident that "threading-up" of the film at the start of the process can be simplified in that the film may be led through the apparatus line at base speed (V) producing transverse direction orientation only then increase of the speed of the main stenter 2B gives the desired draw ratio in machine direction orientation. To facilitate threading up select cam surface 17 (B1) can be brought into play to close clips B close to the inlet end of section 5.

To create the condition of simultaneous machine direction and transverse direction film orientation (ie simultaneous bi-axial orientation) the clips B are made to close at the end of the diverging section D by means of cam surface 17 (B3) instead of by cam 17 (B2) at the inlet section 5.

Further, the opening cam 18 of the clips B may be located before the end of the stenter 2B and specifically at the end of the crystallizing zone ie as 18 (B2) so that reduction in speed of the take-off roller in conjunction with a small amount of convergence of the opposing chain rails (16) produces a desired amount of relaxation in the film.

In Fig 12, the clip is mounted off-set to the centre line of the chain base channel 7. The clip base 6 carries a rearwardly directed bead clearing arm 24 near to the base 6 of the following clip so that when articulation takes place when the clip goes onto the end sprocket 4B the arm 24 will move radially outwards (as shown dashed in Fig 12) for film edge clearing.

The bead 10 is severed from the film prior to sprocket 4B ie at point K, and the extremity of the arm 24 is suitably shaped above the level of platform 6A to be effective in ejecting the trimmed edge bead from the

throat of the clip body so reducing the common danger of the bead edge being retained in the apparatus to give rise to a possible "wrap".

The above stenter apparatus gives the following advantages:

1. Ease of film feeding and guiding to the preliminary stenter (2A);

2. Ease of film transfer from the preliminary stenter to the main stenter;

3. Film retention in transverse direction tension by a roller form of clip; and

4. Ease of removal of trimmed bead edge at the end of the line.

5. In prior art orientation apparatus, machine direction film orientation (stretching) was achieved by having the film run between sets of driving rollers which sets had appropriate speed differential to impart the desired film orientation. A disadvantage of this arrangement was that rollers of the drive sets engaging the film could damage the surface of the film eg cause scuffing. Consequently care had to be taken in selecting the point of coating of the film, and in particular the coating location was necessarily after the orientating operation which was not always desirable. This problem is substantially avoided in the above arrangement, as film drawing in the above arrangement is achieved by the use of hold back film clips (A) rather than by drive rollers: film coating can be effected at any appropriate location.

It will be understood that modifications are possible in the apparatus, particularly in clips A-C, and that any of clips A-C could be used in stenter system different from that shown in Fig 1.

In the modification shown in Figs 9 and 10 in which like parts to those of the previous embodiments carry like reference numerals, the clip C is arranged so that the axis of the roller 19 is inclined at an acute angle α to the plane of the film F. Consequently the roller

19 is inclined inwardly relative to the adjacent film edge, and to facilitate gripping of the film F by the roller 19, the periphery of the roller 19 is of frusto-conical form. It is contended that this inwards incline of the roller 19 will promote more effective gripping of the film F. Further, the shaft 13A for the operating roller (item 13 not shown) will now occupy a relatively higher elevation, and this should considerably convenience the installation of the members 25 presenting the operating cam surfaces 17, 18 for the roller (13).

Fig 10 shows the roller 19 in the lowered position (full line) and in the raised position (dashed line). A blade gripper generally similar to gripper 8 of Figs 3/4 could be used instead of the roller 19 in Fig 9.

Fig 11 shows a modification to the film orientation system of Fig 1. Thus in place of the preliminary stenter 2A, a preliminary roller system 30 is provided and serves to hold-back the film passing on the main stenter 2B. The main stenter 2B can be exactly as in Fig 1. Of course, the roller system 30 would be used when some marking or scuffing of the film is acceptable.

Claims

1. Stenter apparatus comprising a main film treatment means in the form of a main stenter (2B) including film clips (B,C), and a film-holder up-line of said main stenter (2B) characterised in that the main stenter (2B) includes an initial substantially parallel section (5) prior to a diverging transverse-direction film stretching section (D), in that said film-holder comprises film hold-back means (2A, 30) for the creation of film draw in the main stenter (2B), and in that control means are provided for the film clips (B, C), operable to create machine direction (ie longitudinal) draw in film in said initial section (5) of the main stenter (2B).

2. Stenter apparatus as claimed in claim 1, characterised in that said film hold-back means comprises a preliminary stenter (2A) with film holding clips (A).

3. Stenter apparatus as claimed in claim 1, characterised in that said film hold-back means (2A) comprises a roller system (30 Fig 13).

4. Stenter apparatus as claimed in any one of claims 1 to 3 characterised in that the main stenter (2B) and the preliminary film hold-back means (2A) are adapted for handling edge beaded film with the edge-bead (10) directed upwardly.

5. Stenter apparatus as claimed in claim 4, characterised in that clip means are provided for holding the beaded film (F) which clip means are arranged to function such that during film movement in said initial section (5) of the main stenter (2B) film slippage is possible relative to the clip means.

6. Stenter apparatus as claimed in any one of the preceding claims, characterised in that said clip control means serve to set the clips of the main stenter (2B) for simultaneous bi-axial orientation (stretching)

of the film.

7. Stenter apparatus as claimed in any one of the preceding claims, characterised in that film heating means are present in said initial section (5) of the main stenter (2B).

8. Stenter apparatus as claimed in claim 7, characterised in that said film heating means of the initial section comprises infra-red heating means, while convection heating means are present in the diverging section (D) of the main stenter (2B).

9. Stenter apparatus as claimed in claim 4, characterised in that bead edge severing means are provided for removal of the edge-bead (10) at the completion of the stenter process.

10. Stenter apparatus as claimed in claim 9, characterised in that the stenter (2B) comprises clips each including a bead clearing element (24) which functions when the clip is moving around an end sprocket (4B) to clear the severed bead (10).

11. Stenter apparatus as claimed in any one of the preceding claims including a film clip comprising a film holding element (8, 19), mounting means (11A) for said film holding element (8, 19) such that said element is movable in a plane essentially parallel to the machine direction of the stenter apparatus, a support body (6) for the mounting means (11A) and drive means (9) for movement of the film holding element (8, 19) characterised in that said mounting means (11A) carry said film holding element (8, 19) for a swinging movement of the element (8, 19) and in that said drive means (9) serve to swing said element (8, 19) in said plane into and from a film holding position.

12. Apparatus as claimed in claim 11, characterised in that the drive means (9) comprises an eccentric drive.

13. Apparatus as claimed in claim 11 or 12, characterised in that the mounting means (11A) are arranged such that when the film holding element (8, 19)

is swung by the drive means (9) towards a bottom dead centre position for film gripping, in the film holding position the holding element (8, 19) trails or lags said bottom dead centre position.

14. Apparatus as claimed in any one of the claims 11 - 13, characterised in that the film holding element is of plate type (8).

15. Apparatus as claimed in claim 14, characterised in that the plate-type holding element (8) has a lower edge of arcuate form facilitating film gripping while the support body (6) includes an abutment surface (6B) to stabilise the holding element in the raised position.

16. Apparatus as claimed in any one of claims 11 to 13 when dependant on claim 5, characterised in that the film holding element is in the form of a roller (19).

17. Apparatus as claimed in any one of claims 14 to 16, characterised in that the film holding element includes a peripheral lip (8A, 19A) to facilitate use of the clip with beaded film (10).

18. Apparatus as claimed in claim 11, characterised in that the mounting means (11A) are orientated (Fig 9) so as to be inclined at an acute angle (α) relative to the film (F) to be gripped and such that the film holding element (19) is inclined inwardly relative to the adjacent film edge.

19. Apparatus as claimed in claim 12, characterised in that the drive means (9) includes a cranked spindle (11), with an actuator (12) coupled to a first spindle portion (11B) for pivoting motion of the cranked spindle (11), said holding element (8, 19) being swingeably mounted on a second spindle portion (11A) eccentrically located relative to the first spindle position (11B).

20. Apparatus as claimed in claim 19, characterised in that the actuator (12) comprises a swinging arm carrying an actuator element (13) adapted for engagement with a control means for example cam surfaces (17, 18).

21. Apparatus as claimed in claim 11 and for use with beaded film, characterised in that the drive means

(9) are arranged such that in a film holding position longitudinal slippage is permitted between the film holding element (8) and the film, but with the film held laterally by means of the film holding element (8) reacting with the film bead (10).

22. A film clip for use in stenter apparatus, comprising a film holding element (8, 19), mounting means (11A) for said film holding element (8, 19) such that said element is movable in a plane essentially parallel to the machine direction of the stenter apparatus, a support body (6) for the mounting means (11A) and drive means (9) for movement of the film holding element (8, 19) characterised in that said mounting means (11A) carry said film holding element (8, 19) for a swinging movement of the element (8, 19) and in that said drive means (9) serve to swing said element (8, 19) in said plane into and from a film holding position.

23. A film clip as claimed in claim 22, characterised in that the drive means (9) comprises an eccentric drive.

24. A film clip as claimed in claim 22 or 23, characterised in that the mounting means (11A) are arranged such that when the film holding element (8, 19) is swung by the drive means (9) towards a bottom dead centre position the holding element (8, 19) trails or lags said bottom dead centre position.

25. A film clip as claimed in any one of the claims 22 - 24, characterised in that the film holding element is of plate type (8).

26. A film clip as claimed in claim 25, characterised in that the plate-type holding element (8) has a lower edge of arcuate form facilitating film gripping while the support body (6) includes an abutment surface (6B) to stabilise the holding element in the raised position.

27. A film clip as claimed in any one of claims 22 to 24, characterised in that the film holding element is

in the form of a roller (19).

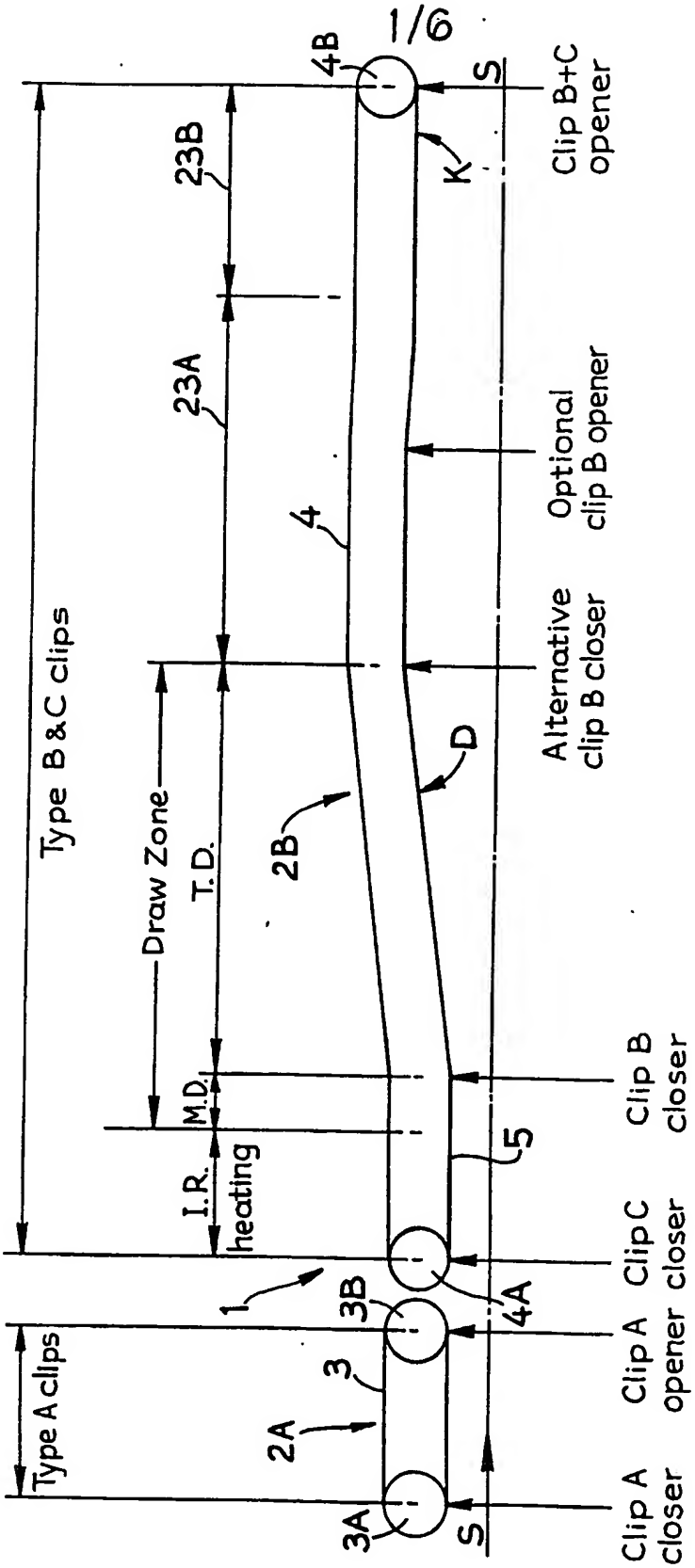
28. A film clip as claimed in any one fo claims 25 to 27, characterised in that the film holding element includes a peripheral lip (8A, 19A) to facilitate use of the clip with beaded film (10).

29. A film clip as claimed in claim 22, characterised in that the mounting means (11A) are orientated (Fig 11) so as to be inclined at an acute angle (α) relative to the film (F) to be gripped and such that the film holding element (19) is inclined inwardly relative to the adjacent film edge.

30. A film clip as claimed in claim 23, characterised in that the drive means (9) includes a cranked spindle (11), with an actuator (12) coupled to a first spindle portion (11B) for pivoting motion of the cranked spindle (11), said holding element (8, 19) being swingeably mounted on a second spindle portion (11A) eccentrically located relative to the first spindle position (11B).

31. A film clip as claimed in claim 30, characterised in that the actuator (12) comprises a swinging arm carrying an actuator element (13) adapted for engagement with a control means for example cam surfaces (17, 18).

32. A film clip as claimed in claim 22 and for use with beaded film, characterised in that the drive means (9) are arranged such that in a film holding position longitudinal slippage is permitted between the film holding element (8) and the film, but with the film held laterally by means of the film holding element (8) reacting with the film bead (10).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23B
23A
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D
2B
Type B&C clips
Draw Zone
T.D.
M.D.
I.R. heating
5
Clip B closer
Clip C closer
1
3B
4A
Clip A opener
3
2A
Type A clips
3A
S
Clip A closer

Fig. 1

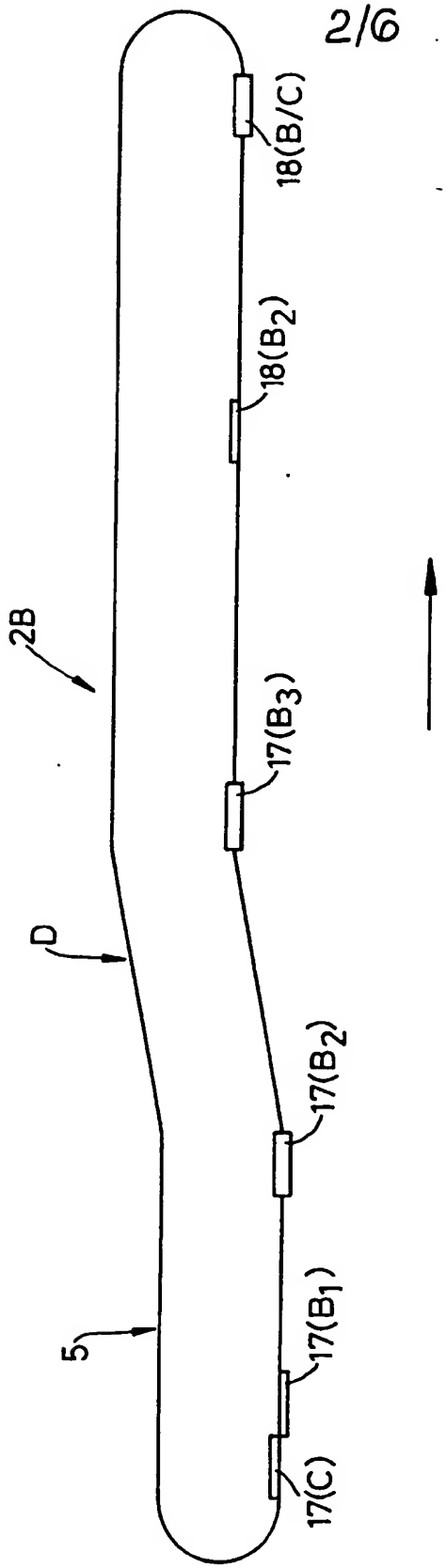


Fig. 2

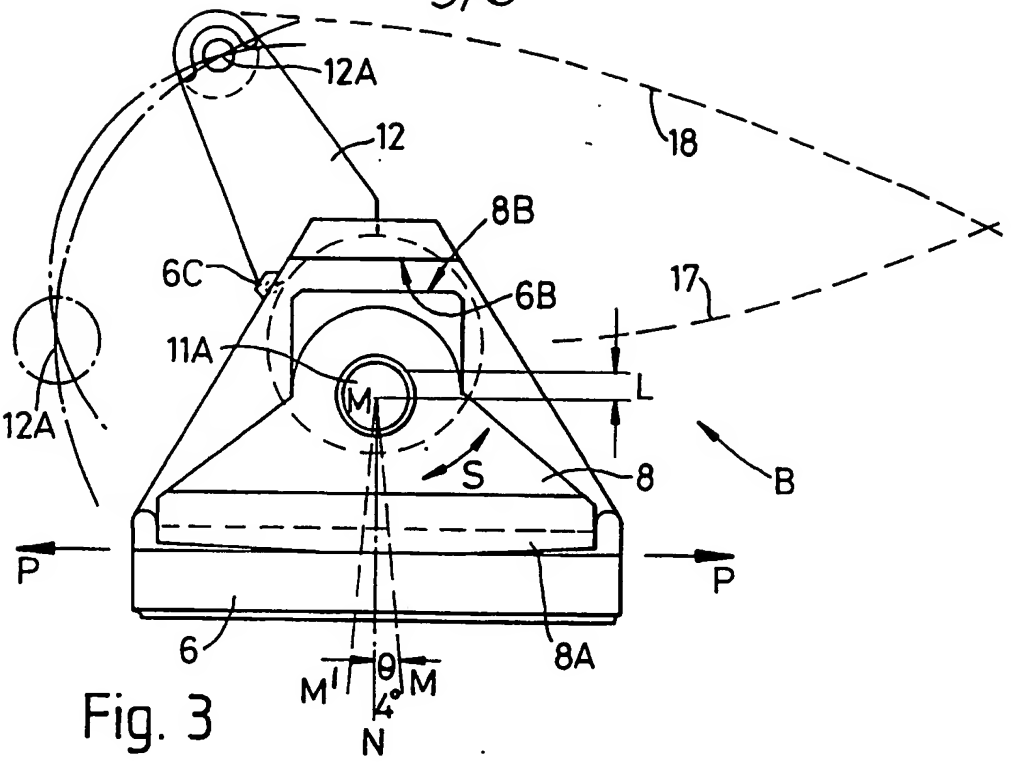
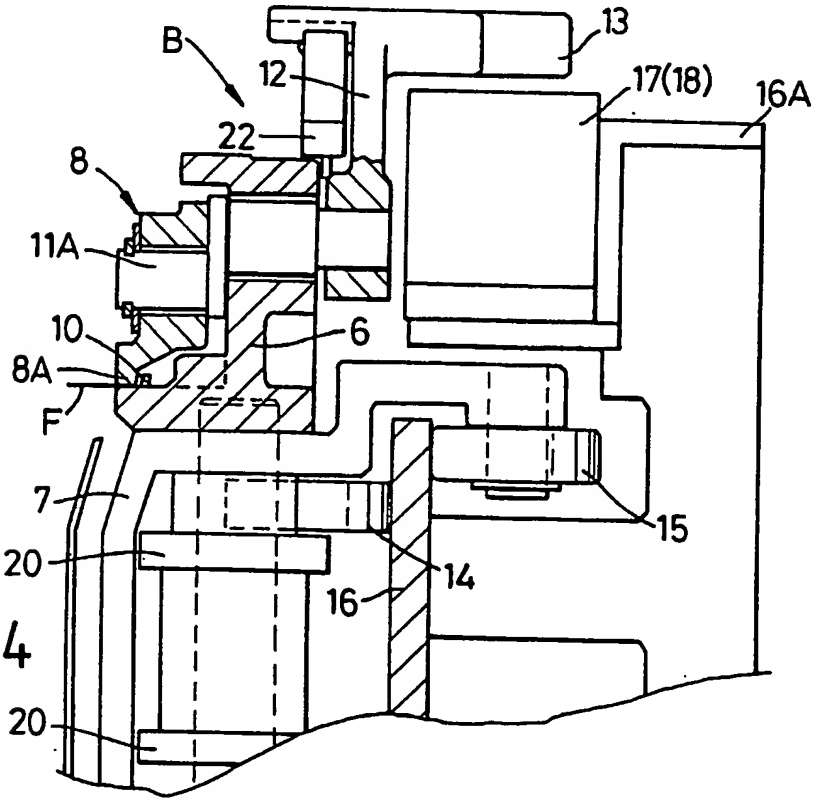

12A
12
18
8B
6C
6B
17
11A
L
M
12A
S
8
B
P
P
6
8A
M
θ
M
4°
N

Fig. 3


B
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12
17(18)
16A
22
8
11A
10
6
8A
F
7
15
20
14
16
20

Fig. 4

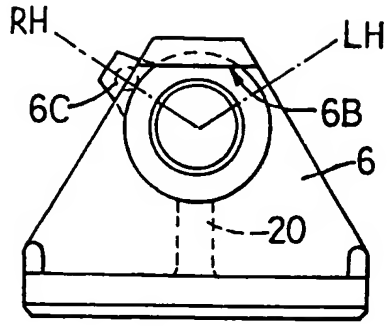


Fig. 5

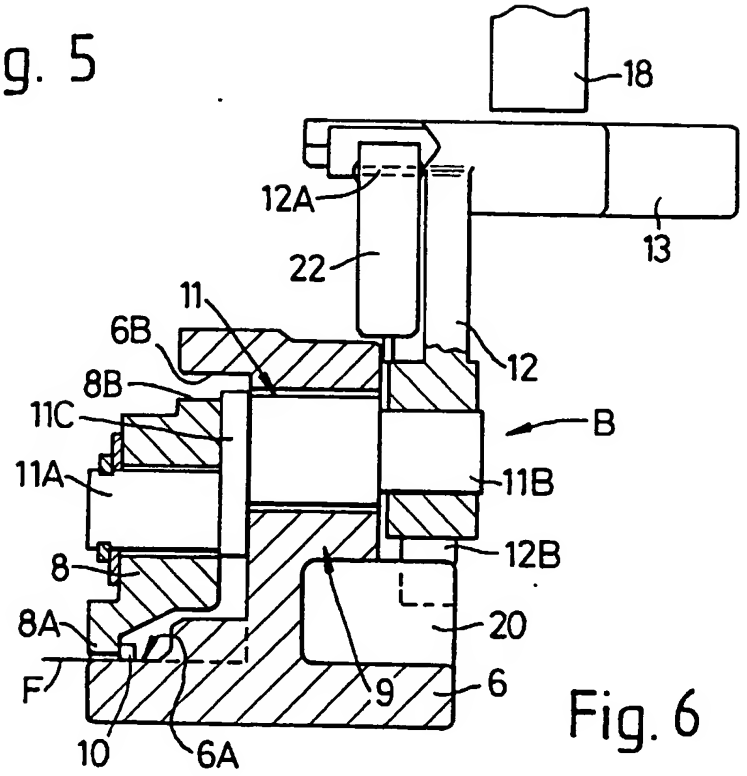


Fig. 6

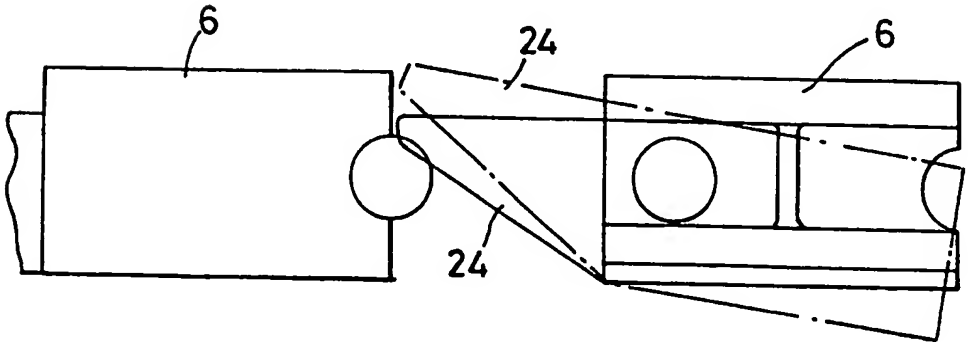
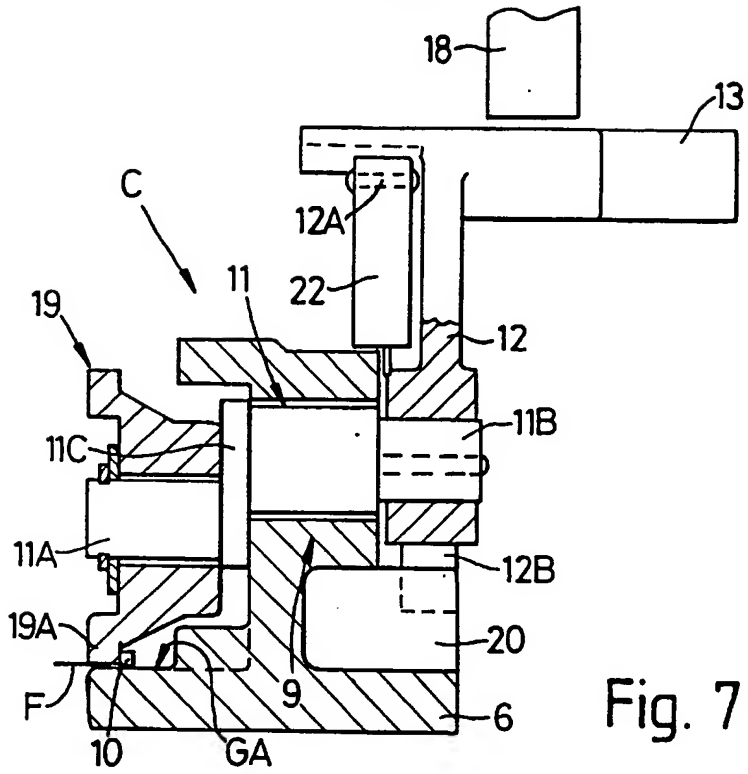


Fig. 12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19A
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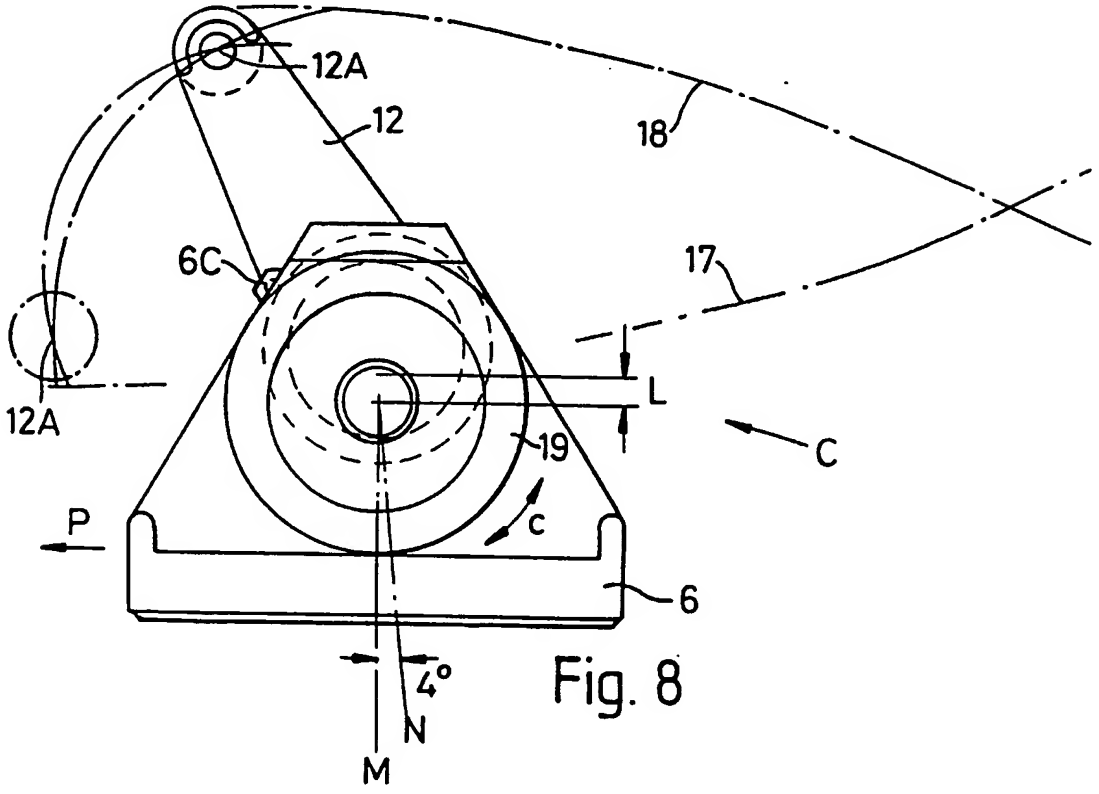
GA

Fig. 7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12A
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C
P
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4°
N
M

Fig. 8

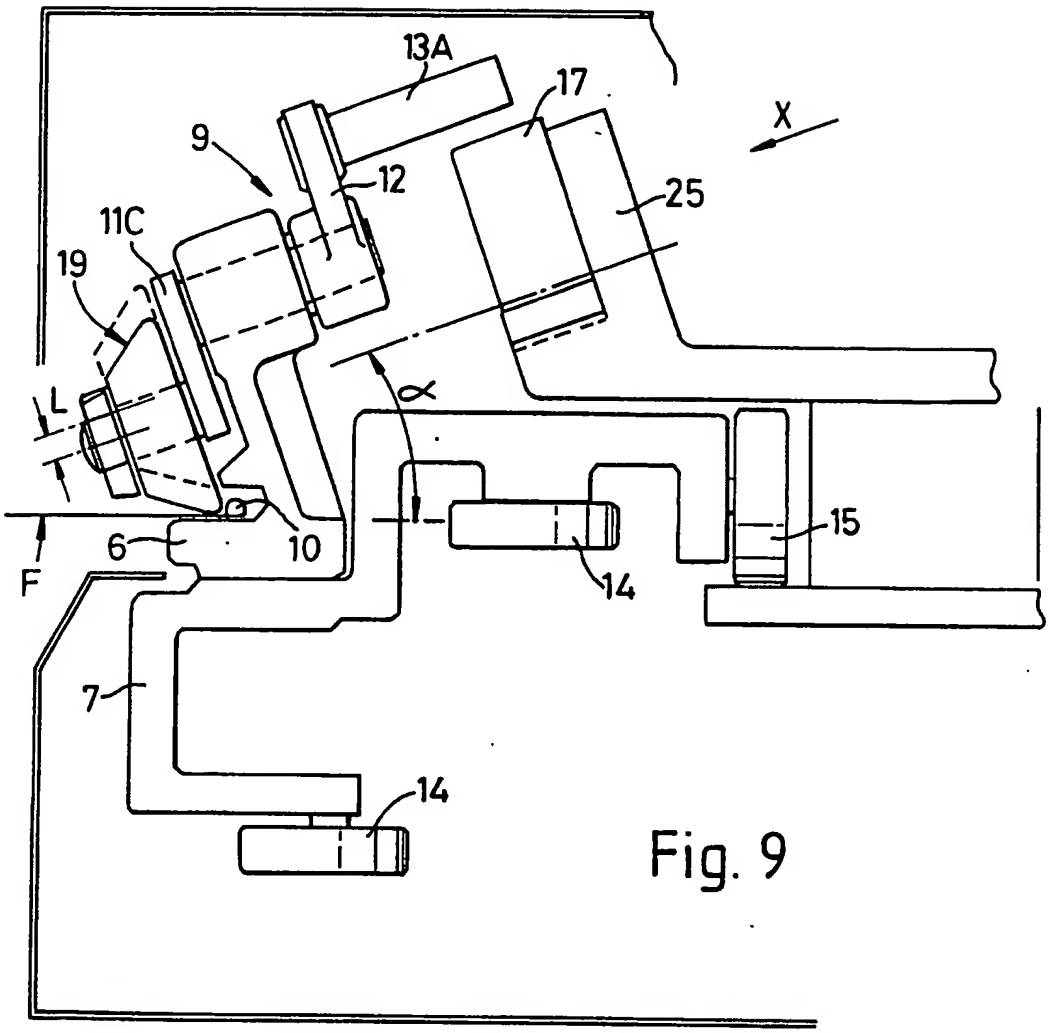
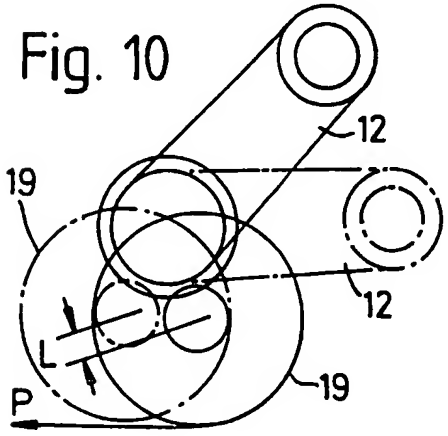


Fig. 9

Fig. 10



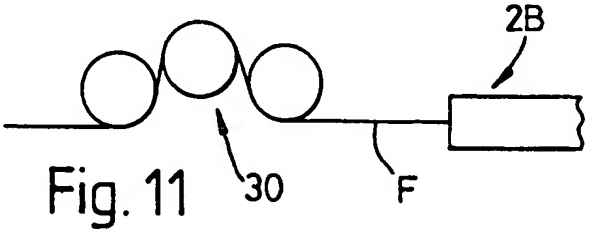


Fig. 11

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 90/01077

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[5]: B 29 C 55/14, B 29 C 55/20

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[5]	B 29 C, D 06 C

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	US, A, 2412187 (WILEY et al.) 3 December 1946 see column 1, line 1 - column 2, line 38; column 8, line 1 - column 9, line 51; claims; figures	1,3-4
Y	--	2,5-10
Y	EP, A, 0122787 (PROCTOR AND SCHWARTZ) 24 October 1984 see the whole document (cited in the application)	2,5-10
	--	
A	FR, A, 2314038 (LINDAUER DORNIER) 7 January 1977 see claims; figures	1-10
	--	
A	FR, A, 1091716 (E.I. DU PONT) 14 April 1955 see claims; figures	1-10
	--	
A	DE, B, 1273796 (BAYER) 25 July 1968 see figures	1-10
	--	
	./.	

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
29th November 1990	18. 12. 90
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	miss T. MORTENSEN

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, ** with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	GB, A, 1091971 (BAKELITE XYLONITE) 22 November 1967 see claims; figures --	1-10
A	Research Disclosure, no. 164, December 1977, R.C. Barnard et al.: "Tenter clip", page 30, abstract no. 16436, see page 30, right-hand column; figures --	11,16,18, 21-22,27, 29,32
A	US, A, 4193175 (RICHTER) 18 March 1980 see column 3, lines 6-21; figures --	11,22
A	FR, A, 346477 (MILARD) 23 January 1905 see figures --	11,22
A	FR, A, 338800 (MARCHAND) 4 July 1904 see figures	11,22

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE [1]

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers....., because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claim numbers....., because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claim numbers....., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. ☒ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING [2]

This International Searching Authority found multiple inventions in this international application as follows:

1. Claims 1-10: A stenter apparatus comprising a main stenter and a film hold-back means for the biaxial treatment of film.
2. Claims 11-32: A film clip for use in stenter apparatus.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

☒ The additional search fees were accompanied by applicant's protest.

☐ No protest accompanied the payment of additional search fees.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. GB 9001077 SA 38597

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 11/12/90 The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 2412187		None	
EP-A- 0122787	24-10-84	None	
FR-A- 2314038	07-01-77	JP-A- 51151771	27-12-76
FR-A- 1091716		None	
DE-B- 1273796		NL-C- 122034 NL-A- 258910	
GB-A- 1091971		None	
US-A- 4193175	18-03-80	US-A- 4155148 DE-A,C 2830236 GB-A,B 2009271 JP-A,B,C 54072277	22-05-79 23-05-79 13-06-79 09-06-79
FR-A- 346477		None	
FR-A- 338800		None	